and graphical) in the upper classes of schools that prepare for the universities; (2) mathematics as needed in the study of physics. In preparation for these discussions, information is being collected as to the conditions prevailing in different countries. The information collected will be published in *L'Enseignement Mathématique* (Paris: Gauthier-Villars); and as regards the position of (1) in this country, a report in greater detail will be published by the Board of Education. The meetings and other proceedings at Cambridge will be open to all who pay the subscription of a guinea.

THE annual report of the council of the Institution of Mechanical Engineers includes as an appendix a draft scheme for associate membership examinations. Just as the Institution of Civil Engineers and the Surveyors' Institution have found it expedient to hold similar examinations, the council of the Institution of Mechanical Engineers is of opinion that the time has come for instituting an entrance examination for the younger applicants for admission to its institution. The council suggests (1) that the examination should be taken, especially by graduates, at as early an age as possible, and in order to bring such a scheme gradually into operation it might be desirable that it should apply in the first year only to candidates of twenty-eight years of age and under, in the second year to candidates of twenty-nine years of age and under, and in the third and subsequent years to candidates of thirty years of age and under; (2) that no examinations need be held abroad at present; (3) that, so far as possible, examinations of universities and colleges or other public examining bodies should be accepted as exempting from the institution examination, it being understood that only such examinations as are of at least a standard equal to the institution examination will be accepted. A list of examinations which might be accepted as exempting candidates is provided, and it may be noted this list includes the engineering degrees of British universities, the diplomas of the City and Guilds College, University College and King's College, London, and Whitworth scholarships and exhibitions. The suggested subjects of examination are grouped under general, scientific, and technical knowledge.

THE standing committee, of which Sir Matthew Nathan is chairman, dealing with the employment of boy labour in the Post Office, has issued its second report. In the first report, published last year, a number of recommendations were made, which have been acted upon. A scheme of education for the boys, designed to improve their qualifications and to fit them for further employment, has been approved by the Postmaster-General. The number of boy messengers was reduced from 15,790 in March, 1911, to 14,506 in September, 1911. Instead of there being only 1900 vacancies per year in the Post Office service for these boys to fill later, a revised estimate gives the number as 2350, of which 1280 are for postmen. The Navy and the Royal Engineers can also take some of the boys for special service. The report deals also with the boys' training for subsequent employments. A useful purpose is served by the boys' institutes, which are carried on mainly by the voluntary work of local officials, and receive grants amounting to 2000*l.* a year from the Treasury. The evening schools of local education authorities also have been made use of, half the boys' fees being paid out of institute funds. The number of boys who attended classes during the session 1910–11 in London and seventy-eight provincial towns was 6479, or about 70 per cent. of the whole number employed in those towns. To remedy irregular attendance, which has been somewhat pronounced, the committee recommended compulsory attendance at the classes, and a minimum of four hours a week, from September to April, was fixed, this being made a condition of employment during the boys' first two years of service. Special classes for the boys are recommended, and an essential feature is that the boys' attendances are to be arranged so that each class should always be composed of the same boys. The committee approached the Postmaster-General with these recommendations, and he approved of their being carried out without delay. The committee has come to the conclusion that the basis for permanent employment shall be a competitive examination in the subjects taught at the compulsory classes.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 8.—Sir Archibald Geikie, K.C.B., president, followed by Sir Alfred Kempe, vice-president and treasurer, in the chair.—Sir Norman **Lockyer**: The spectrum of comet Brooks (1911*c*). In this paper an account is given of the lines shown in a series of ten photographs of the spectrum of comet Brooks, taken between September 6 and October 31. Seven of the photographs were taken while the comet was an evening object, and three when it was a morning object. The instrument used was a 2-in. quartz-calcite prismatic camera. In the best spectrum (September 30), in addition to the well-established carbon or carbon-compound bands at $\lambda\lambda$ 3883, 4737, 5165, 5635, other radiations were seen at $\lambda\lambda$ 310, 316, 337, 405, 421, and 436. Line λ 421 is probably the cyanogen band, the head of which is λ 4216. So far as is known, the ultra-violet bands $\lambda\lambda$ 310, 316, 337 have not been recorded in the spectrum of any previous comet. Attempts have been made to ascertain the chemical origin of these lines by reference to published records of laboratory spectra, and to recent photographs of the spectrum of CO taken with the quartz-calcite prism, but with no success. Although no definite changes in the relative intensity of the cometary lines were noted amongst the earlier photographs, a comparison of the best of these (September 30) with that of October 31, when the comet was a morning object, showed the following changes:—(1) On September 30 line λ 4216 was weakest of the three subsidiary lines $\lambda\lambda$ 405, 4216, 436. On October 31 it was strongest. (2) Lines $\lambda\lambda$ 3883, 4737 were of about equal intensity on September 30. On October 31 λ 3883 was distinctly the stronger. (3) The ultra-violet lines $\lambda\lambda$ 310, 316, 337, shown in the spectrum of September 30, were not seen on October 31. A photographic comparison is given of the Kensington spectrum of comet Brooks (September 30) with that of comet Daniel (1911*d*), reproduced by Campbell in Lick Bulletin No. 135. Although the latter showed far more detail, being photographed with a slit spectrograph, it is fairly evident that the spectra of the two comets are very similar.—Hon. R. J. **Strutt**: A chemically active modification of nitrogen, produced by the electric discharge.—III. (1) Active nitrogen emits its energy more quickly, and reverts sooner to ordinary nitrogen, if it is cooled. This is apparently a unique instance of a chemical change accelerated by cooling. (2) If the glowing gas is compressed to small volume, it flashes out with great brilliance, and exhausts itself in so doing. This proves that the glow-transformation is polymolecular, *i.e.* that more than one molecule must take part in it. (3) Active nitrogen may revert to ordinary nitrogen in two distinct ways. One of those is a volume change, accompanied by glow; the other a surface action of the walls of the vessel, without glow. This is analogous to the behaviour of oxyhydrogen gas in its transformation to water, which may be a surface or volume effect, according to circumstances.—R. **Whytlaw-Gray** and Sir W. **Ramsay**: The atomic weight of radium. The material for this research consisted of 330 mg. of a mixture of radium and barium bromides, containing 206 mg. of radium bromide, supplied by the courtesy of the British Radium Corporation. The bromides were submitted to methodical fractional crystallisation, and yielded specimens of which the change in weight on conversion from bromide to chloride with gaseous hydrogen chloride, and from chloride to bromide with gaseous hydrogen bromide, was determined with the micro-balance. The atomic weight increased progressively from 220·7, through a series of approximations, to the final atomic weight 226·36, the last five determinations giving the figures 226·40, 226·25, 226·35, 226·35, and 226·45. The paper contains remarks on the differences in terms of multiples of the atomic weight of helium between the recorded determinations of the atomic weight of uranium and radium on the one hand, and of radium and lead on the other, and it is pointed out that a careful revision of the atomic weights of lead and of uranium, especially of the latter, is much to be desired.—Dr. J. A. **Harker** and Dr. G. W. C. **Kaye**: The emission of electricity from carbon at high temperatures. This paper discusses several new phenomena, among which are the generation of electric currents of considerable magnitude by what appears to be a new method. Two insulated carbon electrodes are inserted into a carbon tube resistance furnace at high temperatures, and are connected externally through a suitable current-measurer. If one of the electrodes is suddenly displaced to a colder or hotter part of the furnace, a reversible transient current is produced in the circuit without the application of any external potential. By such means, currents up to 2 amperes have been obtained. The production of an alternating current is thus rendered possible by the use of a suitable periodic device. A continuous current can be generated by suitably modifying the apparatus so as to maintain a large permanent temperature-difference between the electrodes. A steady current of 0·8 ampere has been thus obtained for a few minutes, and 0·1 ampere for more than an hour by water-cooling one electrode. These currents are such as would be produced by a discharge of negative particles from the hot electrode. At the lower temperatures positive currents have also been detected, but of much smaller magnitude. All the observations were made at atmospheric pressure. The extent of the ionisation of the furnace atmosphere at high temperatures was such that quite small E.M.F.'s, applied to two exploring electrodes, gave rise to steady currents of relatively enormous magnitude. For example, with 8 volts, currents up to 10 amperes have been obtained at a temperature of about 2500° C. Some of these observations have been repeated with furnaces of a non-electric character.—Prof. H. T. **Barnes**: The so-called thermoid effect and the question of superheating of a platinum-silver resistance used in continuous-flow calorimetry.—Prof. E. G. **Coker**: An optical determination of the variation of stress in a thin rectangular plate subjected to shear. The distribution of stress in a rectangular plate subjected to shear is examined by observing the optical effects in polarised light produced in a stressed plate of xylonite. Measurements of the shear stress at a point are obtained by using a specimen of material similar to the plate, and set along the direction of principal compression stress. A tension load is applied to this member of sufficient amount to produce a dark field at the point under examination. The intensity of tension stress so produced is twice the density of the shear stress in the plate. A survey of the central longitudinal section of a long rectangular plate shows that the shear stress rises very rapidly from a zero value at the ends, and reaches a maximum at a distance of rather less than the face width of the plate. As the distance from the ends increases, the stress decreases slightly in value until it reaches a minimum at the centre. A similar distribution also occurs at sections parallel to the central line. As the length of the plate is diminished the maximum and minimum stresses become more pronounced, and when the ratio of length to width is in the neighbourhood of two, the distribution changes in such a manner that there is a maximum at the centre. It is shown that the distribution is approximately parabolic when the length is equal to the width of the plate, and that when the length is greater than this the approximation is less close. The experiments show that a parabolic distribution of shear is only true within narrow limits, and that in a long rectangular section the distribution may be approximately represented by a uniform shear over the central section with a rapid fall towards the ends.—Dr. P. V. **Bevan**: Spectroscopic observations: lithium and cæsium. —Captain C. F. U. **Meek**: A metrical analysis of chromosome complexes, showing correlation between evolutionary development and chromatin thread-widths throughout the animal kingdom. Measurements of chromosomes in organisms representing the principal phyla and classes of the animal kingdom have shown that lengths appear to constitute members of a series in arithmetical progression, whereas three distinct diameters exist, viz. 0·21 μ in Protozoa, and 0·42 μ and 0·83 μ in low and higher metazoan phyla respectively. Consideration of these results has suggested the following working hypothesis:—The chromatin granules of simplest Protozoa are a visible expression of differentiation and aggregation of specialised particles concerned with transmission of hereditary characters, and as such probably do not represent the sole bearers of heredity in the cell. The granules become converted into rods by purely linear growth accompanying evolutionary development and greater somatic complexity, and, since the rate of growth is not the same in all chromosomes, rods of various lengths are evolved. A stage in phylogeny is later reached when a maximum rod length has been attained, such limit being imposed by spindle mechanism or other physical conditions; when this occurs, chromatin units conjugate in fours, and the normal thread-width is thus doubled. The newly formed chromosomes then segment into spheres of the same diameter, and these are prepared to enter a new course of linear growth accompanying further development. The same process is repeated when the length-limit has again been reached, and in this manner the greatest thread-width has evolved. The absence of correlation between chromosome dimensions and somatic characters is explicable on such an assumption, which postulates a series of cycles in the course of phylogeny. The heterotropic chromosome alone does not belong to the general series, and its great breadth may eventually be shown to be due to conjugation of normal rods; it is probably undergoing some process of development or disintegration, and may or may not be the determining factor in sex.

Linnean Society, February 1.—Prof. E. B. Poulton, F.R.S., vice-president, in the chair.—Fauna of the Seychelles and other islands of the Indian Ocean. (1) A. **Forel**: Fourmis des Seychelles et des Aldabras, reçues de M. Hugh Scott. (2) F. W. **Edwards**: Tipulidæ. (3) Dr. Günther **Enderlein**: Sciaridæ. (4) Claude **Morley**: The Ichneumonidæ. (5) C. Tate **Regan**: New fishes.

Mathematical Society, February 8.—Dr. H. F. Baker, F.R.S., president, in the chair.—A. C. **Dixon**: Exceptions to extensions of a theorem of Jacobi's.—W. **Burnside**: Some properties of groups whose orders are powers of primes.—G. H. **Hardy** and J. E. **Littlewood**: Some results concerning diophantine approximations.

Malacological Society, February 9.—R. Bullen **Newton**: *Presidential address*: "On the Lower Tertiary Mollusca of the Fayum Province of Egypt." The president referred to the discussion among writers on vertebrate palæontology as to the age of the Palæomastodon beds occurring near the base of the Jebel el Qatrani deposits in the north of the Fayum depression of Egypt. Such beds were regarded by Mr. Beadnell and Dr. C. W. Andrews as Bartonian, whereas Prof. Depéret and others had assigned them to the Sannoisian-Stampian division of the Oligocene period. Instead of regarding them as younger, Mr. Newton was of opinion that they might even be older, and he was much in favour of recognising the beds as belonging to the Lutetian-Bartonian stage of the Eocene, since the associated genera Mœritherium, Podocnemis, and Stereogenys occurred alike in these beds as well as in the Qasr el Sagha deposits below, which are undoubtedly of Lutetian or Middle Eocene age. Certain estuarine Mollusca, particularly *Potamides scalaroides* and *P. tristriatus*, occurred high up in the Jebel el Qatrani section and some 150 metres above the Palæomastodon bed; these gastropods have been determined by Dr. Blanckenhorn as indicative of the Bartonian horizon, and are therefore conclusively against the view that the vertebrates belong to the younger period of the Oligocene. Mr. Newton supported these molluscan determinations, and, moreover, upheld Dr. Blanckenhorn's opinion that the species were characteristic of the "Beauchamp Sands" of the Paris Basin, and consequently belonged to the older part of the Bartonian horizon.

PARIS.

Academy of Sciences, January 29.—M. Lippmann in the chair.—The president read a letter from Prince Roland Bonaparte giving a donation of 35,000 francs to the French School of Medicine at Beyrout.—G. **Bigourdan**: An unpublished work of Delambre, "Grandeur et figure de la Terre."—A. **Lacroix**: Lavas from the active volcano of Reunion. Complete chemical analyses are given of thirteen lavas, and a discussion of the results.—Ch. **André**: The total eclipse of the moon of November 16, 1910. The positions of three uncatalogued stars, referred to in the author's previous note on the eclipse, are given. —Hildebrand Hildebrandsson was elected a correspondant for the section of geography and navigation in the place of the late M. Davidson.—J. **Guillaume**: Observations of the sun made at the Observatory of Lyons during the third quarter of 1911. Observations were made on seventy-four days, the results being summarised in three tables.—Henri **Bénard**: The formation of lunar craters according to the experiments of C. Dauzère. A reproduction is given of a photograph by C. Dauzère showing the appearance of a surface of beeswax after solidification, and the bearing of this upon the author's theory of the causes of lunar relief is discussed.—G. **Pick**: Parallel lines and translation, and differential geometry in non-Euclidean space. The results published by the author in a recent paper in the *Comptes rendus* were obtained by M. Fubini in 1900.—J. E. **Littlewood**: Some consequences of the hypothesis that the function $\zeta(s)$ of Riemann has no zero in the demi-plane $R(s) > \frac{1}{2}$.—G. **Cotty**: A class of quadratic forms with four variables connected with the transformation of Abelian functions.—J. **Tamarkine**: The problem of the transversal vibrations of a heterogeneous elastic rod.—Louis **Chaumont**: The construction and verification of a quarter-wave plate of mica.—Emmanuel **Legrand**: Testing metallic lamp filaments for resistance to shock. A detailed description of the testing apparatus is given.—Georges **Meslin**: The application of wireless telegraphy to the measurement of coefficients of self-induction. The method is distinguished from those in ordinary use in that it reduces to a length measurement a quantity (self-induction) which has the dimensions of a length.—Albert **Colson**: The theory of solutions compared with experiment. The case of nitrogen peroxide. The author regards the identification of the dissolved particle with the gaseous molecule as not proven, and considers the thermal changes actually occurring during the process of solution disprove the van't Hoff theory. Experimental determinations by a new method of the partial pressures on NO_2 and N_2O_4 are given.—M. **Barre**: Some double carbonates of calcium. A description of the carbonates

$$CaCO_3.Na_2CO_3.2H_2O \text{ and } CaCO_3.K_2CO_3,$$

and a study of the conditions under which they are formed.—E. **Léger**: The constitution of chrysophanic acid. This acid is shown to be dioxy-1:8-methyl-3-anthraquinone.—A. **Mouneyrat**: The toxicity of the compounds of arsenic employed in therapeutics. For equal weights of the arsenic compound, the danger is greater the shorter the time between successive injections. The experiments were carried out on rabbits, and it was found that the animals showed varying degrees of tolerance to the drug.—A. **Guilliermond**: The leucoplasts of *Phajus grandifolius* and their identification with mitochondria.—François **Kövessi**: The influence of electricity (direct current) on the development of plants. The experiments were chiefly carried out with wheat, and show that the current is harmful to the germination of the seed and to the development of the plant.—Marin **Molliard**: Is humus a direct source of carbon for the higher green plants? If humus can be assimilated directly by green plants, it must be in very small proportions.—Louis **Ammann**: A comparison of the results obtained by maceration and diffusion in beetroot distilleries in agricultural centres. Both methods extract the sugar equally well; the maceration process requires less skilled supervision than the diffusion process, but the latter has the advantages of rapidity and of requiring less liquid.—A. **Marie** and Léon **MacAuliffe**: The morphology of French assassins, suicides, and murderers.—Marcel **Baudouin**: The wear of the teeth of the first and second dentition of men of the Neolithic period is due to earth-eating.—L. A. **Pelous**: The relations between the phenomena of osmosis and the electric discharge. The osmotic pressure is increased by the silent discharge.—A. **Magnan**: The surface of the intestine in mammals.—A. **Comte**: Variation in the moths of *Bombyx mori*.—M. **Trabut**: A disease of the date palm, khamedj, or rotting of the fruit bunch. The disease is due to a parasite, identified as *Phoenicococcus marlatti*.

MELBOURNE.

Royal Society of Victoria, December 14, 1911.—Prof. E. W. Skeats in the chair.—Olive B. **Davies**: The anatomy of the slug *Cystopelta petterdi*, var. *purpurea*. The structure was examined by dissections and by serial sections.—Janet W. **Raff**: Protozoa parasitic in the large intestine of Australian frogs, part ii. *Opalina tenius*, *O. dorsalis*, *O. acuta*, *Entamoeba morula* are described as new.—R. J. A. **Berry** and A. W. D. **Robertson**: Dioptrographic tracings in three normæ of ninety Australian aboriginal crania.—W. **Lowe**: The tropics and pigment. Pigment prevents the entrance of actinic rays, transforms them to heat, which indirectly stimulates the sweat glands and is dissipated.—N. **Macdonald**: Machine-drawn *versus* hand-drawn milk. With proper precautions as to cleanliness, the machine does no harm either to the milk or the cow.—A. J. **Ewart**: Bitter pit and the sensitivity of apples to poison. Ripe pulp cells of apples are extremely sensitive to poison. One part in ten thousand million of mercuric chloride is toxic. Poison can enter the sound fruit only by the breathing pores, and on doing so will produce bitter pit. Copper and lead are less poisonous than mercury. The poisonous action of copper sulphate and other similar metallic salts may be decreased by adding substances which decrease the percentage of free ions. Fungicides will kill the apple long before they kill the fungus.—J. A. **Gilruth** and L. B. **Bull**: Enteritis associated with infection of the intestinal wall by cyst-forming protozoa (Neosporidia) occurring in certain native animals (wallaby, kangaroo, and wombat). Wallaby, *Sarcocystis macropodi*, situated in submucosa; kangaroo, *Ileocystis macropodi*, situated in mucosa, apparently an epithelial infection, and *Lymphocystis macropodi*, apparently a mononuclear infection; wombat, *Ileocystis wombati*, epithelial infection.—K. A. **Mickle**: Flotation of minerals, part ii. Oil attachments. Sulphides adsorb oil more readily than does gangue in acid solutions. Finely divided sulphides in acidulated water attach the oil to form only plastic magma. After this additional oil attachments are unstable; with less oil, less coherent magma is formed, practically non-coherent with 0·1 per cent. oil. Gas attachments. Gas collected from finely divided dry sulphides *in vacuo* found to be CO_2 with smaller amounts N and O. This is probably present as adsorbed film. Gas collected from flotation product *in vacuo* consists of CO_2 with varying amounts N and O. Gas disengaged from flotation scum on bubbles bursting is found to consist of CO_2 and nitrogen, with smaller amounts of oxygen.

BOOKS RECEIVED.

Four Place Tables of Logarithms and Trigonometric Functions. Compiled by E. V. Huntington. Unabridged edition. Pp. 33. (Cambridge, Mass.: Haward Co-operative Society; London: E. and F. N. Spon, Ltd.) 3*s*. net.

Cambridge County Geographies:—Midlothian. By A. McCallum. Pp. x+208+maps. Buckinghamshire. By Dr. A. M. Davies. Pp. xii+222+maps. Northamptonshire. By M. W. Brown. Pp. xii+225+maps. (Cambridge: University Press.) 1*s*. 6*d*. each.

Earth and her Children. By H. M. Livens. Pp. 248. (London: T. Fisher Unwin.) 5*s*. net.

The British Bird Book. Edited by F. B. Kirkman. Section VII. Pp. 194+plates. (London and Edinburgh: T. C. and E. C. Jack.) 10*s*. 6*d*. net.

Irises. By W. R. Dykes. Pp. xiv+110+8 coloured plates. (London and Edinburgh: T. C. and E. C. Jack.) 1*s*. 6*d*. net.

Prehistoric Parables. By W. Bell. Pp. vii+63. (Halifax: Milner and Co.) 1*s*. net.

Electro-analysis. By Prof. E. F. Smith. Fifth edition. Pp. xi+332. (London: Kegan Paul and Co., Ltd.) 10*s*. 6*d*. net.

Waves and Ripples in Water, Air, and Æther. By Prof. J. A. Fleming, F.R.S. Second edition. Pp. xii+299. (London: S.P.C.K.) 2*s*. 6*d*. net.

The Forest Trees of Britain. By the late Rev. C. A. Johns. Tenth edition. Revised by G. S. Boulger. Pp. xiv+431. (London: S.P.C.K.) 6*s*. net.

University of London. Francis Galton Laboratory for National Eugenics. Eugenics Laboratory Memoirs. XV. Treasury of Human Inheritance. Parts vii. and viii. Section XV. A: Dwarfism, by Dr. H. Rischbieth and A. Barrington. Pp. xi + 355–573 + Plates li.–lviii. + O–Z + A.A.–W.W. (London: Dulau and Co., Ltd.) 15*s*. net.

The Migration of Birds. By T. A. Coward. Pp. ix+137. Prehistoric Man. By Dr. W. L. H. Duckworth.